Using All of the Olive: Transforming an Environmental Problem into an Economic Opportunity

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[Photo: Moroccan maâsra workers crush a bed of olives in a concrete vat.]

A simple fermentation technique has the potential to help solve three major challenges of concern to rural Moroccans: how to safely dispose of 180,000 tonnes of olive 'dregs', which are cakes formed from crushed olive sediment; how to ensure that animal feed is affordable after the government reduces imports; and how to create opportunities for educated, jobless youth to start their own micro-businesses.

All of these goals can be achieved using a solid state biomass fermentation process to enrich the protein and reduce the cellulose content of olive dregs, thus making them suitable for animal feed and other uses, reported Mustapha Ismaïli-Alaoui of Morocco's Agronomics and Veterinary Institute (IAV) Hassan II, during a natural products conference held in May 1998 in Ottawa. The week-long event was organized by the International Development Research Centre (IDRC) and l'Université du Québec à Chicoutimi, with assistance from scientists at Carleton University and the University of Ottawa.

Waste products

Olive dregs are the waste byproducts of some 16,000 Moroccan 'maâsra', which are small, traditional olive oil extraction mills. Until now, these cakes have had little economic value. Some are burned in boilers or used to heat homes, but most of them are dumped in the environment, where they may be contaminated by fungi or release toxic compounds. As a result, fungal toxins or polyphenol compounds that resist bacterial degradation can leach out, posing a risk to human and environmental health. This is how some water sources such as the Oued Sebou, a 500 km-long river, have become polluted.

With funding from IDRC, IAV Hassan II, and other institutions, Dr Ismaïli-Alaoui set out to help the farmers who operate maâsra transform olive wastes into useful products. His group already had some experience in the fermentation of bagasse, or sugarcane pulp. The Moroccan team collaborated with Canadian scientists, led by Dr André Morin of the Food Research and Development Centre (FRDC), who shared their expertise in using fermentation to generate flavour extracts.

Fermenting olive dregs

Equipped with a small laboratory incubator, the Moroccans fermented a mixture of olive dregs, locally available bagasse, and a microbial starter culture. The high carbon and nutrient content of the sweet bagasse promotes microbial growth. Their initial experiments showed that with the right microbes, the olive cake mixture could be transformed within two to three days.

Dr Ismaïli-Alaoui and his colleagues identified the best performing strains of microbes from IAV Hassan II's extensive collection, which includes organisms isolated from the natural environment and obtained from international collections. Ultimately, three strains were selected based on their ability to increase protein levels and decrease the cellulose content of the olive dregs — thus improving their digestibility — and also to generate secondary metabolites with commercial potential, such as enzymes and aromatic compounds.

Commercial enzymes

Nutritional measurements showed that the fermented olive dregs contained substantially more protein and were 31% more digestible than the original product. Moreover, the team obtained a variety of enzymes including lipases and esterases, which are used to prepare natural food flavours. In fact, the olive dregs yielded more lipases and esterases than other existing techniques can generate, Dr Ismaïli-Alaoui told the conference. Among other applications, these lipases could be used to help reduce the preparation time of traditional Moroccan foods, such as *smen* (processed salt butter).

Based on a survey of Moroccan maâsra, the team then selected two farms as sites for further experiments. Dr Ismaïli-Alaoui's laboratory provided the microbes needed to start the fermentation process. The farmers also contributed by turning their greenhouses into incubators. They installed a second ceiling made of black plastic film, which acts as a solar blanket to bring the greenhouses up to fermentation temperature.

Expected benefits

If the onsite results match those obtained in the laboratory, "we can expect several benefits," said Dr Ismaïli-Alaoui. For example, the Moroccan government is planning to reduce imports of livestock feed. Although the price of traditional feeds will likely rise, fermented olive dregs should be a more affordable alternative. Moreover, access to a local source of animal feed will make farmers less vulnerable to feed supply fluctuations during periods of harsh climate. Finally, young Moroccan graduates who are now victims of high unemployment rates will have opportunities to create their own businesses by exploiting markets for the enzymatic byproducts of fermented olive dregs, he concluded.

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Resource Persons:

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